

Listing of Claims

This listing of claims will replace all prior versions and listings of claims in the Application for patent.

1. (CURRENTLY AMENDED) A method of forming synthetic microspheres, comprising:
providing an agglomerate precursor, wherein the agglomerate precursor comprises at least one aluminosilicate material and at least one binding agent, wherein the agglomerate precursor includes an agglomeration of at least one aluminosilicate material and at least one binding agent, wherein the agglomerate precursor has an alkali metal oxide content of less than about 10 wt. % based on the weight of the precursor; and
firing the precursor at a pre-determined temperature profile sufficient to combine the aluminosilicate material with the binding agent so as to form a microsphere having a substantially spherical wall, a substantial void volume and an average particle diameter greater than 30 microns.
2. (ORIGINAL) The method of claim 1, wherein the firing step comprises firing the precursor at a temperature range of between about 600 to 2500 °C.
3. (ORIGINAL) The method of claim 1, wherein the firing step is performed in a fluidized bed reactor.
4. (ORIGINAL) The method of claim 1, wherein the firing step is performed in a vortex furnace.
5. (ORIGINAL) The method of claim 1, wherein the firing step is performed in a heated vertical pipe.
6. (ORIGINAL) The method of claim 1, wherein the firing step is performed in a fuel fired furnace.
7. (ORIGINAL) The method of claim 2, wherein the firing step further comprises firing the precursor for a period of about 0.05 to 20 seconds.

8. (ORIGINAL) The method of claim 1, further comprising providing a blowing agent and activating the blowing agent during the firing step so as to release a blowing gas, thereby forming at least one substantially enclosed void in the precursor.

9. (ORIGINAL) The method of claim 8, wherein the firing step comprises forming a molten skin around the precursor.

10. (ORIGINAL) The method of claim 9, wherein the blowing agent is activated during the formation of the molten skin.

11. (ORIGINAL) The method of claim 9, wherein the blowing agent is activated after the formation of the molten skin.

12. (ORIGINAL) The method of claim 9, wherein the blowing gas is substantially trapped inside the molten skin.

13. (CURRENTLY AMENDED) A method of manufacturing synthetic microspheres, comprising:

providing an agglomerate precursor comprising a pre-determined amount of at least one primary component comprising an aluminosilicate and a pre-determined amount of at least one pre-selected chemical, wherein the at least one pre-selected chemical is combined with the primary component to form a mixture and wherein the agglomerate precursor has an alkali metal oxide content of less than 10 wt. % based on the weight of the precursor;

drying the mixture to form the agglomerate precursor to a first moisture level, the agglomerate precursor including at least one primary component bound to at least one pre-selected chemical; and

firing the agglomerate precursor so as to react the at least one pre-selected chemical to form substantially spherical microspheres having a substantial void volume and an average diameter greater than 30 microns.

14. (ORIGINAL) The method of claim 13, wherein the at least one pre-selected chemical comprises a binding agent.

15. (ORIGINAL) The method of claim 14, wherein the at least one pre-selected chemical further comprises a blowing agent, wherein the blowing agent, when reacted in the firing step, releases an amount of blowing gas, wherein the blowing gas expands the precursor thereby forming a plurality of microspheres with one or more substantially enclosed voids therein. 1

16. (PREVIOUSLY PRESENTED) The method of claim 13, wherein the aluminosilicate in the primary component is selected from the group consisting of fly ash, basaltic rocks and combinations thereof, wherein the blowing agent is selected from the group consisting of powdered coal, carbon black, sugar, and silicon carbide, wherein the binding agent is selected from the group consisting of alkali silicates, hydroxides, and combinations thereof.

17. (ORIGINAL) The method of claim 13, wherein the firing step comprises firing the mixture at a temperature range of between about 600 to 2500 °C.

18. (ORIGINAL) The method of claim 13, further comprising rapidly cooling the synthetic microspheres after the firing step.

19. (ORIGINAL) The method of claim 15, wherein the blowing gas is selected from the group consisting of CO₂, CO, O₂, N₂, N₂O, NO, SO₂, H₂O, and mixtures thereof.

20. (ORIGINAL) The method of claim 13, wherein drying the precursor to a first moisture level comprises drying the precursor to a moisture level of less than about 14 wt. %.

21. (ORIGINAL) The method of claim 13, wherein the drying step comprises drying the agglomerate at a temperature of about 400 °C. prior to the firing step.

22. (ORIGINAL) The method of claim 13, wherein the drying step comprises drying the agglomerate at a temperature of about 50 °C. prior to the firing step.

23. (ORIGINAL) The method of claim 13, wherein the drying step is configured to remove moisture from the precursor so as to substantially reduce rupturing of the agglomerates during the firing step.

24. (CURRENTLY AMENDED) A method of forming synthetic microspheres, comprising:
providing an agglomerate precursor, wherein the agglomerate precursor comprises a primary component with at least one aluminosilicate material of a pre-selected particle size, a blowing agent configured to release a gas when activated and a binding agent, wherein the agglomerate precursor is formed by:

mixing the primary component, blowing agent and binding agent with water to form a substantially homogenous mixture; and

drying the mixture to form the agglomerate precursor, the agglomerate precursor comprising bound particles; and

firing the precursor at a predetermined temperature and a predetermined period of time to activate the blowing agent to release gas, wherein the temperature is greater than 800 degrees Centigrade and the time is 20 seconds or less, thereby forming microspheres with an internal void and an alkali metal oxide content of less than about 10 wt. %

25. (NEW) A method of forming synthetic microspheres, comprising:

providing an agglomerate precursor, wherein the agglomerate precursor comprises at least one aluminosilicate material and at least one binding agent, wherein the agglomerate precursor is substantially dry, wherein the agglomerate precursor has an alkali metal oxide content of less than about 10 wt. % based on the weight of the precursor; and

firing the precursor at a pre-determined temperature profile sufficient to combine the aluminosilicate material with the binding agent so as to form a microsphere having a substantially spherical wall, a substantial void volume and an average particle diameter greater than 30 microns.

26. (NEW) The method of claim 1, wherein the agglomerate precursor has a water content of about 10 wt.% or less.

Statement of Substance of Interview under 37 C.F.R § 1.133

Applicants submit this Statement of Substance of Interview in accordance with 37 C.F.R § 1.133 to be made of record for the Application identified herewith and respectfully requests entry of this statement.

The statement provides a summary of a telephone interview held September 10, 2009, with Examiner Queenie Dehghan and Applicants' representative. Applicants first wish to thank the Examiner for being available and for providing useful information and recommendations. Her professionalism was much appreciated.

In the telephone interview held on September 10, 2009, the cited documents of U.S. Application Publication No. 2002/0004111 (hereinafter "Matsubara") and U.S. Patent No. 3,838,998 (hereinafter "Matthews") were discussed and distinctions between these documents and Applicants' claimed invention were also discussed. In addition, Applicants suggested that the Examiner may have a misunderstanding or incomplete definition of the term "agglomerate." While the Examiner provided a general meaning of the term as "gathering into a mass," Applicants expressed an understanding that the term also included some sort of cohesion and was not just a simple gathering, which could be applied to air or water. Applicants, having reviewed an Interview Summary mailed September 14, 2009, herewith also wish to correct the record (i.e., statements written on the continuation sheet) because Applicants did not state that an "agglomerate is understood to be particles that have to be put through a heat treatment and bound together." Applicants merely offered het treatment as one example of how an agglomerate may be formed. In addition, Applicants correct the record of the Interview Summary mailed September 14, 2009, by making it clear that Applicants submitted that Matsubara does not form an agglomerate, and instead it was pointed out by Applicants that Matsubara wet pulverized its materials in a combustible liquid to "prepare a slurry," which Applicants argued is not an agglomerate precursor. The slurry of Matsubara is then formed into liquid droplets, which is expressly taught at para. [0035] of Matsubara. The liquid droplets are pressurized under gas and

heat, and combustion of the liquid is necessary for the formation of hollow glass spheres, which is expressly taught at para. [0047]-[0048] and [0049]-[0052] of Matsubara. It was further reiterated by Applicants in the interview that the slurry and droplet method as provided by Matsubara is not combinable with Matthews. This is because Matthews does not form spheres from liquid droplets. Instead, Matthews forms dry feed particles, as taught in Col. 8, and it is the feed particles that are then heated at very specific sequence of different temperatures in a furnace to form spheres. Matthews specifically teaches that its feed particles must include two different glass formers that are heat at two different temperatures in order to form the spheres, as expressly taught in Col. 10 and 13. Moreover, it was reiterated by Applicants in the interview that Matthews also relies on distinctly different starting materials and that Matthews does not have feed particles that have an alkali metal oxide content of less than about 10 wt. % based on the weight of the feed particle (as taught by Matthews at Col. 6, lines 50-56), and, thus, Matthews starting materials are contrary to and very different from Applicants claimed invention.

This is intended to be a written statement as to the substance of a telephone interview held on September 10, 2009, with Examiner Dehghan and an Interview Summary mailed September 14, 2009.